REMARKS

This application has been carefully reviewed in light of the Office Action dated August 9, 2005. Claims 1, 5 to 9 and 19 to 24 are in the application, of which Claims 1 and 19 are independent. Reconsideration and further examination are respectfully requested.

Turning first to a procedural matter, Applicant thanks the Examiner for his acknowledgment of receipt of the certified copy of the priority document. However, in acknowledging receipt, it is believed that the Examiner "checked the wrong box", since the subject application is not a national stage application of a PCT filing. It is therefore respectfully requested for the Examiner to re-acknowledge his receipt of the certified copy of the priority document.

Turning to the merits of the Office Action, all claims were rejected under 35 U.S.C. § 103(a), primarily over U.S. Patent 6,317,246 (Hayashi) in view of U.S. Patent 6,496,293 (Kawamura) and further in view of U.S. Patent 5,247,385 (Takanashi). In addition, in the rejection of several of the dependent claims, the Office Action relied on one or more of the following: U.S. Patent 6,259,547 (Kamikubo); U.S. Patent 5,724,172 (Ota); and U.S. Patent Application Publication 2003/0128412 (Iizuka).

In response, Claim 1 has been amended primarily to include the features of dependent Claims 2 through 4. In making these changes, certain text from the original language of Claim 1 has been eliminated, and in this sense the amended claims are broader than those originally presented. In addition, the amendment includes text that was

inadvertently omitted from the original language of dependent Claim 2, i.e., the second plastic lense is now correctly described as a lens "having negative power in the main scanning direction". Support for this description can be found throughout the specification, such as the description of fθ lens 8 at page 23, lines 4 through 7 of the specification.

In view of the nature of the amendments made to the claims, this should be viewed as a traversal of the rejection, as detailed more fully below.

The invention of the rejected claims concerns an optical scanning device, and an image forming apparatus utilizing such a scanning device, in which a light flux having a wavelength equal to or smaller than 500 nm is scanned by a scanning optical system onto a surface to be scanned. According to one aspect of the invention, the scanning optical system consists of a glass lens, a first plastic lens, and a second plastic lens, which are disposed in this order from deflecting means, wherein the glass lens has a negative power in the main scanning direction, the first plastic lens has a positive power in the main scanning direction, and the second plastic lens has a negative power in the main scanning direction.

According to a second aspect of the invention, at least one surface of each of the first and second plastic lenses in the main scanning direction is aspherical, and the overall scanning optical system satisfies a relational expression that is detailed in independent Claim 1, as amended.

In entering the rejection of the claims, the Office Action conceded that the primary reference to Hayashi does not disclose a light flux having a wavelength equal to or smaller than 500 nm. However, the Office Action took the position that it would have

been obvious to incorporate the teachings of Kawamura, which describes a wavelength range of 350 nm $\leq \lambda \leq$ 600 nm. Applicant respectfully traverses this assertion.

In particular, Hayashi discloses a light source within the infrared range of 780 nm. Hayashi selects his wavelength for a specific reason, and that reason is to minimize the maximum difference of wavelength $\Delta\lambda$ among the plurality of light sources, so as to reduce the chromatic aberration of magnification due to these wavelength differences.

Hayashi therefore selects his wavelength for a reason, such that it is unreasonable to modify it according to Kawamura's wavelength which differs significantly from the 780 nm wavelength of Hayashi.

Moreover, Applicant believes that those of ordinary skill in the art would recognize that such a modification is irrational. If the invention of Hayashi were modified so that it used a wavelength range of 350 nm $\leq \lambda \leq$ 600 nm (as disclosed by Kawamura), the chromatic aberrations that Hayashi seeks to minimize actually become quite large and, as a consequence, become a serious problem. This is because the wavelengths in the range of Kawamura (350 nm $\leq \lambda \leq$ 600 nm) are much smaller than that of the infrared range of Hayashi (780 nm).

For both of these reasons, it is respectfully asserted that those of ordinary skill in the art would not have any motivation to modify the teachings of Hayashi so as to incorporate the wavelength of Kawamura.

It is further noted that the wavelength disclosed in the tertiary reference to Takanashi is also in the infrared range of 780 nm. Like Hayashi, Takanashi also addresses

chromatic aberrations of magnification. As a consequence, therefore, it also would be unreasonable to incorporate the wavelengths disclosed by Kawamura into the device disclosed by Takanashi, for the same reasons that it is unreasonable to modify the device of Hayashi.

Applicant further asserts that even if such a combination were made (which it is not reasonable to do, as described above), his invention would not be the result. It is Applicant's understanding that all of the lenses in Takanashi's first embodiment are made of glass. Applicant therefore believes that Takanashi does not describe a three-lens optical scanning system as claimed herein, in which there is a glass lens having negative power in the main scanning direction, a first plastic lens having positive power in the main scanning direction, and a second plastic lens having negative power in the main scanning direction.

The reasons for Applicant's belief that all of the lenses in Takanashi's first embodiment are glass are as follows. In his study of the optical qualities described by Takanashi for the lenses of his first embodiment, he has found that they are quite similar to the glass properties for certain glasses manufactured by Ohara, Inc. A copy of the Ohara Glass Catalog is attached, and it also can be viewed on the Internet at http://www.oharacorp.com/PDF/Ohara_Glass_Catalog.pdf. The Ohara Glass Catalog includes a chart entitled "n_d - ν_d diagram", which is found at the second chart after page 21 of the Glass Catalog. Based on the properties of the glasses shown in this chart, as matched against the glass properties disclosed in the first embodiment of Takanashi, it is believed that the lenses are selected from the Ohara materials as follows:

lens 51: S-FTM 16
lens 52: S-FPL 51
lens 53: S-LAL 13

The Glass Catalog further includes all of the optical properties of these glasses, as can be confirmed by the Examiner.

Accordingly, it is believed that all of Takanashi's lenses in his first embodiment are glass, such that Takanashi does not disclose or suggest at least the feature of a scanning optical system which consists of a glass lens having negative power in the main scanning direction, a first plastic lens having positive power in the main scanning direction, and a second plastic lens having negative power in the main scanning direction.

By comparison, optical plastic materials that might be used in a light scanning apparatus are explained in connection with U.S. Patent 6,400,391 (Suhara), which is assigned to Ricoh Company, Ltd. together with all of the references to Hayashi, Kawamura and Takanashi. As explained at column 3, lines 7 to 36 of the Suhara patent, in connection with his Figure 12, plastic materials applicable to plastic lenses are restricted due to characteristics such as coefficient of moisture absorption, photoelastic coefficient, and refractive index distribution. Acrylic resin is ordinarily not suitable because it has a large coefficient of moisture absorption. Likewise, polycarbonate (PC) is ordinarily not suitable because a birefringence is apt to arise due to significantly large photoelastic coefficients. Polyolefin resin has been most widely used for scanning lenses due to its relatively smaller coefficient of moisture absorption and relatively better birefringence

characteristics. These optical materials, however, do not coincide with the above-noted chart of Ohara's "n_d - ν_d diagram".

Applicant therefore believes it is reasonable to presume that all lenses in Takanashi's first embodiment are made of glass material, and none of them is made of plastic.

The present invention benefits from a scanning optical system in which the first lens is a glass lens, and in which the second and third lenses are plastic. Specifically, according to the claims, at least one surface of each of the first and second plastic lenses in the main scanning direction is aspherical. In comparison with a glass material, a plastic material is advantageous in terms of productivity, cost and realization of the desired shape which in this case is "aspherical" within the main scanning direction. Thus, there is benefit in including plastic lenses together with a glass lens. On the other hand, if all of the plurality of lenses were made of plastic, it might become impossible to correct the chromatic aberration of magnification. Accordingly, there is also benefit in inclusion of a glass lens.

It is therefore respectfully submitted that the rejected claims would not have been obvious from any permissible combination of the applied art, and withdrawal of the rejection is respectfully requested.

New Claims 19 to 24 are directed to a scanning optical device and an image forming apparatus using it, which are not necessarily limited to a wavelength equal to or smaller than 500 nm. However, in view of the above discussion of the art applied against the rejected claims, it is not believed that any permissible combination of the applied art

would disclose or suggest an optical scanning device wherein a scanning optical system consists of a glass lens having a negative power in the main scanning direction, a first plastic lens having positive power in the main scanning direction, and a second plastic lens having negative power in the main scanning direction, wherein at least one surface of each of the first and second plastic lenses in the main scanning direction is aspherical. Allowance of Claims 19 to 24 is therefore respectfully requested.

An Information Disclosure Statement accompanies this Amendment, so as to make the aforementioned Ohara Glass Catalog and the Suhara patent formally of record.

Applicant's undersigned attorney may be reached in our Costa Mesa, California office at (714) 540-8700. All correspondence should continue to be directed to our below-listed address.

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